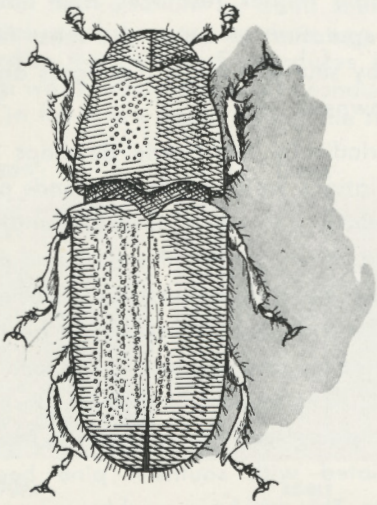
How To Beat the Beetle



Aerial view of trees killed by the southern pine beetle

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IN COOPERATION WITH

U. S. DEPARTMENT OF
AGRICULTURE
U. S. FOREST SERVICE
SOUTHEASTERN AREA, STATE AND
PRIVATE FORESTRY

Introduction

The southern pine beetle (Dendroctonus frontalis Zimmerman) is the most destructive insect enemy of pines in the southern United States. Each year it kills millions of dollars of valuable timber resources and has earned the reputation of being the most feared insect by southern forest managers and timber landowners.

Periodically this beetle develops epidemic populations which kill large stands of timber, sometimes exceeding several hundred acres in size. What triggers the explosive outbreaks is not completely understood. Most entomologists believe these epidemics to be the result of complex and interacting factors favoring beetle development. However, through the years, poor tree vigor appears a main factor associated with southern pine beetle outbreaks. This can be caused by many weakening factors leading to stand stress, leaving the trees easy prey for attacking beetles. THE KEY TO MINIMIZING LOSSES TO THE SOUTHERN PINE BEETLE IS REDUCING STAND STRESS THROUGH GOOD FOREST MANAGEMENT PRACTICES.

IDENTIFYING THE SOUTHERN PINE BEETLE AND ITS HABITS

The southern pine beetle is a small reddish-brown to black beetle about one-eighth to three-sixteenths of an inch long which breeds in all species of southern yellow pine and occasionally eastern white pine. Shortleaf, Virginia, loblolly, pitch, and pond pines are preferred species. The beetle has a four stage life cycle: egg, larva, pupa (resting stage), and adult (Figure 1).

Adult beetles attack living pines in pairs, bore through the bark and construct galleries in the cambium where they lay eggs. Small C-shaped larvae or "grubs" hatch from

the eggs and feed in the cambium of the tree. The grubs develop into pupae and then into adult beetles which emerge through the bark to attack other pines. The life cycle from egg to adult beetle takes from thirty to forty days under favorable conditions and may be repeated four to eight times a year.

Mining in the cambium by adult southern pine beetles, as they construct their egg galleries, girdles the tree and introduces bluestain fungi which reduces or blocks conduction of water in the tree's trunk, killing the tree.

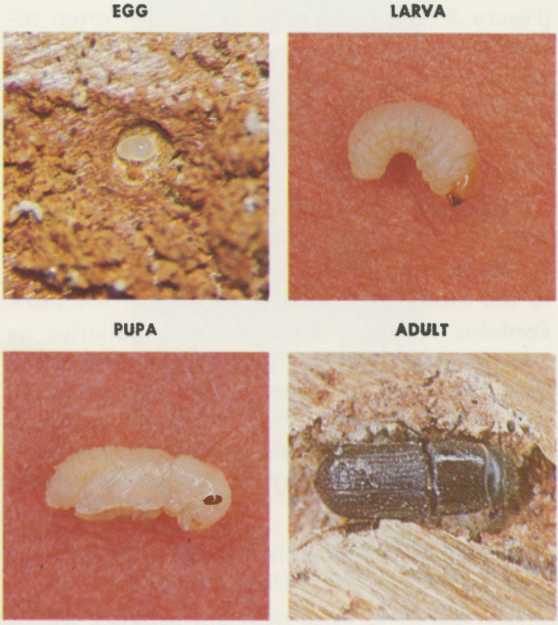


Figure 1. Life cycle of the southern pine beetle.

RECOGNIZING THE BEETLE'S DAMAGE

The beetle kills pines in patches ranging from one tree to thousands of trees. Usually the first sign of an infestation is discoloration of tree crowns (Figure 2). Needles fade to a dull green, turn yellowish, become straw colored and finally turn reddish-brown within one to two months.

Small, light yellow or white pitch tubes formed at the beetle's entrance holes may be seen along the entire length of the tree's trunk (Figure 3 (U)). These masses of pitch often resemble popcorn in size, shape and color but are not always present. Close examination of infested trees will show reddish boring dust lodged in bark crevices or in cobwebs at the base of the tree.

The best method of determining if a dying tree has been attacked by the southern pine beetle is to remove a section of the bark down to the wood. If the inner surface of the bark contains winding, S-shaped egg galleries as seen in Figure 3 (L), this is positive indication that the southern pine beetle has attacked the tree. If the beetles have not already emerged, the C-shaped larvae, pupae and new adult beetles may be found by cutting open the bark.

Figure 2. A typical southern pine beetle infestation.

Figure 3. Pitch tubes formed on bark surface (U); Egg galleries beneath the bark (L).

HIGH BEETLE RISK STANDS AND POSSIBLE CORRECTIVE METHODS

To increase the resistance of timber stands to southern pine beetle attack, the forest landowner must recognize those stands which are highly susceptible to attack and know what can be done to improve the condition of the timber stand.

Experience has shown stressed stands are prime targets for attack by southern pine beetles. Following is a description of these stands and ways to correct the problem.

1. **Littleleaf Diseased Stands**—Littleleaf disease is a disease of shortleaf pine and to a lesser extent, loblolly pine. It is caused by factors involving a soil fungus and adverse soil conditions. Littleleaf occurs in the piedmont region and is characterized by stunted, yellowish needles and reduced twig growth (Figure 4). Diseased trees

usually die from the bottom up, have greatly reduced diameter growth, and often produce abundant crops of small cones. Disease symptoms seldom appear before trees reach 20 years of age or about 4 inches in diameter. Littleleaf disease is associated with the majority of southern pine beetle infestations in the piedmont.

Figure 4. Littleleaf diseased tree (L) and healthy tree (R).

Diseased Healthy

Solution

- In stands having a few diseased trees, remove them during normal thinnings.
- In stands with 10-25 percent of the trees diseased, remove all diseased trees on a six-year cutting cycle.
- In stands with more than 25 percent of the trees diseased, cut all shortleaf pine as soon as merchantable.
- When replanting high littleleaf sites, use loblolly pine or other more resistant tree species.

2. **Mature and Overmature Stands**—Mature stands are those in which the trees have attained full development. Overmaturity

Figure 5. Mature and overmature stand of sawtimber.

quickly follows this stage and trees rapidly decline in vigor. Diameter and height growth slow markedly and trees generally display small, flat-topped crowns and thin, slick-barked trunks (Figure 5). Trees in this stage are often further weakened by a variety of heart and butt rot diseases which invite attack by the beetle.

Solution
- In stands containing scattered mature and overmature trees, remove these trees in thinnings as soon as possible.
- In stands where the majority of the trees are in these stages, harvest the entire stand and reforest.

3. **Overstocked Stands** — Overstocked stands are those that contain more trees than are desirable to maintain vigorous and sustained growth levels (Figure 6). They have not stopped growing but have shown a marked decrease in their growth rate in recent years. This decrease in growth is the result of crowding and competition for water, soil nutrients and sunlight.

Solution
- Thin the stand to remove crowded, crooked, diseased, suppressed, damaged, or otherwise undesirable trees. Remaining trees should respond through increased diameter

Figure 6. Overstocked stand of pulpwood.

and height growth.

- Additional thinnings will become necessary as the trees continue to grow. The stand should be watched closely and thinnings made before the growth rate reaches an undesirable level.

4. **Stagnated Stands**—Stagnated stands are characterized by large numbers of small diameter trees with thin, short crowns (Figure 7). They are generally the result of overplanting or neglecting to thin at the proper time. Stands in this condition have negligable growth rates and do not respond to thinning.

   Solution • Sell merchantable trees in the stand then completely clear the area and reforest. Do not

Figure 7. Stagnated stand of slash pine at sixteen years of age.

plant more trees than the site can support. Slash pine is especially susceptible to stagnation if overplanted or thinned too late.

5. **Natural Occurrences Causing Stand Stress** —Nature itself can cause stand stress and result in physically damaging the trees or weakening them. The major natural factors causing stress are: lightning strikes (Figure 8), wildfire, ice, wind and hail storms, drought, flooding, erosion and poor soil fertility.

   Naturally damaged trees frequently attract southern pine beetles and allow them a "foothold" for breeding epidemic populations capable of spreading to adjoining, undamaged stands.

   Solution • Wildfire, ice, wind, hail or storm damaged trees should be harvested through sanitation or salvage thinnings directed at removing only severely weakened and damaged trees. The remaining stand should be watched for later infestations that might arise.

   • Trees struck by lightning

Figure 8. Large shortleaf pine damaged by lightning strike.

should be removed or cut and sprayed with a registered pesticide if left in the stand.

- During periods of severe drought or flooding, pine stands should be watched closely for signs of beetle infestation. In cases of flooding, surface drainage should be improved.

6. **Activities of Man Causing Stand Stress**— Numerous activities of man which cause stand and site disturbances can result in southern pine beetle infestation if not corrected. Some of these are logging (Figure 9), road, pond and power line construction and maintenance. Nearly all of these involve heavy equipment use which can cause soil compaction (reducing oxygen needed by the root system), crush tree roots, and skin or bruise tree trunks.

Solution

- Logging should be planned to minimize damage to the site and the remaining stand of timber. Avoid logging sites when soil is very wet as compaction can occur.

Figure 9. Pine skinned by careless logging.

- Salvage trees damaged by careless logging practices and road and power line construction.
- Avoid soil disturbances that will adversely affect the water table.
- Following man-caused distur-

bances, examine affected stands periodically for signs of beetle infestation.

GLOSSARY

Cambium—A thin sheath of generative and nutrient conductive tissues lying between the tree's outer bark and inner wood.

Crown—The branches and foliage of a tree.

Cutting cycle—The planned interval between major cutting operations in the same stand.

Epidemic populations—Insect populations that increase faster than the factors which normally keep them in balance.

Infestation—A localized group of dead and dying pine trees resulting from attack by the southern pine beetle.

Merchantable trees—Trees of a size, quality, and condition suitable for marketing.

Stand—A community of trees sufficiently uniform in species composition, age, or condition to be distinguishable from adjoining communities.

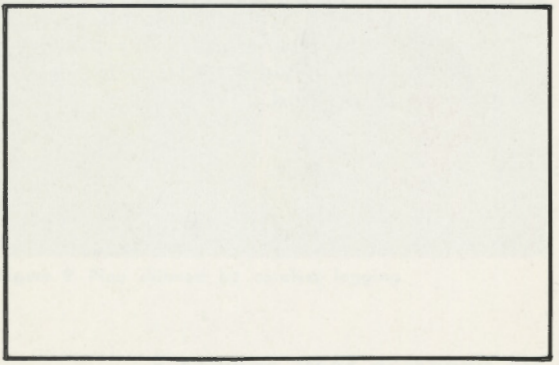
Suppressed trees—Trees with crowns entirely below the general level of the crown cover, receiving no direct light either from above or from the sides.

Thinning—Cuts in an immature stand to reduce the number of trees to improve the growth, quality, yield and species composition of a stand.

WHERE TO OBTAIN ASSISTANCE

Keep your timber stands healthy and vigorous by seeking the advice of a professional forester. Assistance is available through the South Carolina State Commission of Forestry, the U. S. Forest Service, Clemson University Extension Service, forest industry personnel, and private consulting foresters.

For Additional Information or Assistance Please Contact:



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